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ABSTRACT

This topical series is produced twice yearly and is intended to help keep school and district administrators abreast of critical issues in mathematics and science teaching and learning. Readers will find examples of and suggestions on how to support teachers as they strive to improve classroom practices and encourage student learning. This issue contains information on the characteristics of a learning community, leading a professional learning community, and establishing a professional learning community. Within the category of establishing a professional community are descriptions for developing a common focus, ensuring effective collaboration, engaging in discourse, addressing conflict, sharing professional knowledge, lesson studies, creating time for collaboration, and a resource list. (SAH)

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Practical Inquiry: Effective Practices That Support Teaching and Learning in Mathematics and Science, 2000.

Jennifer Stepanek, Editor

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Mathematics and Science Education Center

Practical Inquiry

Effective Practices that Support Teaching and Learning in Mathematics and Science

Northwest Regional Educational Laboratory

Fall 2000

Supporting Mathematics and Science Teachers as a Professional Learning Community

Mathematics and science teachers face an increasingly demanding job. They must deal with changing ideas of effective practice, growing diversity among their students, and higher standards for both teaching and learning. While the national mathematics and science standards advocate more rigorous curriculum and instruction, both documents also recognize the need for a supportive learning environment. The standards recommend that teachers think of their classrooms as communities in order to encourage and assist students in learning challenging mathematics and science.

The literature on school improvement and effective professional development also suggests that learning communities are equally important for teachers. A sense of community helps to create a dynamic and congenial workplace and establishes relationships that encourage continuous inquiry and improvement (Collay, Dunlap, Enloe, & Gagnon, 1998; Lieberman & Miller, 1999). In addition, teachers take on roles as scholars, showing their students that learning is exciting and worthwhile.

The process of creating and sustaining a professional learning community is a complex and challenging endeavor. It requires time, trust, and commitment from all participants, especially school leaders. Some people may dismiss the idea as another buzzword or a vague ideal intended to make teachers feel better about their schools and their work. However, research on school improvement suggests that the presence of a professional learning community in a school has a positive impact on student achievement and is an essential component of effective teaching and learning (Hord, 1997; Newmann & Wehlage, 1995).

The Mathematics and Science Education Center produces *Practical Inquiry* twice yearly. The topical series is intended to help keep school and district administrators abreast of critical issues in mathematics and science teaching and learning. Readers will find examples and suggestions of how to support teachers as they strive to improve classroom practices and encourage student learning.

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Characteristics of a Learning Community

Thinking about the school as a community is not a new idea. John Dewey is often credited with developing the concept, and his approach is helpful in understanding what community means in a school. For Dewey, community is not just a name for a collection of individuals or an ideal of harmony and collaboration. It is a process of people living, working, and especially learning together: asking questions, listening to other viewpoints, comparing ideas, and imagining alternatives. "One cannot share in intercourse with others without learning—without getting a broader point of view and perceiving things of which one would otherwise be ignorant" (Dewey, 1916).

There is no step-by-step process that schools can implement as they strive to establish a learning community. However, there are a number of school characteristics associated with professional learning and collaboration, which are described briefly on the right (Adajian, 1996; Hord, 1997; Kruse, Louis, & Bryk, 1994; Zederayko & Ward, 1999).

It may be helpful to begin by looking at the characteristics and thinking about what they might mean in a specific school or district. Are there elements of a learning community that are already in place at this school? What characteristics are not in place? A second step will then be to consider the implications for school leaders and to engage the school staff in thinking about the questions on the facing page.

> Building trust, protecting ideas, and establishing new norms of caring and concern for one another as well as for students takes time, and capacity. They are the glue that holds a professional community together.
>
> — Ann Lieberman & Lyn Miller, 1999

The key characteristics of a professional learning community include:

Common Goals
Teachers take on collective responsibility for student learning, which provides the shared purpose and criteria of success for all efforts. In spite of the overarching focus on students learning, the specific goals will be articulated and negotiated by the teachers.

Collective Inquiry
Teachers are accustomed to observing and discussing each other's teaching methods and philosophies. All staff engage in learning new ways to talk about teaching. Teachers work together to develop materials, activities, and strategies and to choose and create professional development opportunities.

Reflective Dialogue
Teachers talk to each other about their practice and their students. Topics may include content knowledge, assumptions and rationale behind instructional decisions, or the process of adopting new strategies, to name just a few.

Supportive and Shared Leadership
Teachers have the freedom and authority to make decisions and to explore alternatives and innovations in instruction. The organizational norms and structures support and encourage collaboration and inquiry.

Mutual Trust and Respect
Teachers have a sense of emotional safety that enables them to share their thinking and their practice. They are willing to open up their classrooms to each other, observing instruction and providing each other with feedback.

Continuous Learning Opportunities
The professional learning community is not a one-time effort, but a way of working together that is embedded in the school culture. All staff put in the time and effort required to maintain collaborative relationships and focus on inquiry and improvement. Teacher learning is given a high priority and teachers' efforts are supported and celebrated by the whole school.

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Leading a professional learning community

School leaders have an important role to play in the professional learning community, although it may be quite different than the traditional model of educational leadership. The leader will move beyond the traditional means of establishing authority, instead "leading from the center" (Dufour, 1999) and engaging with teachers as a co-learner and co-teacher.

Acting as a learner is likely to be an unfamiliar leadership role. As teachers work to change and improve their practice, it is important for principals and other school leaders to understand the rationale for the changes. Standards-based mathematics and science teaching may be very different from administrators' expectations about effective teaching methods. Learning with and from teachers in order to understand and support their work is essential to improving mathematics and science (Nelson, 1999).

The process of sharing authority with teachers should not be misinterpreted as a hands-off approach to leadership. While it often involves giving up some of the usual demonstrations of authority—such as setting agendas, making isolated decisions, and directing policies—there are a number of new responsibilities that leaders must take on (Hord, 1997). Some of the biggest challenges involve knowing when to facilitate, when to step in, when to be silent, and when to change directions. In addition, a high priority will be mediating conflicts and accommodating differences as teachers strive to collaborate. Other duties include:

- Building consensus and establishing common goals
- Sharing authority and responsibility with teachers
- Helping to create a climate of trust and respect
- Working with teachers to design and implement processes for professional learning
- Establishing interdependence
- Honoring teachers' learning and accomplishments
- Creating forums for teachers to share their ideas and accomplishments
- Providing teachers with needed information and time
- Advocating for teachers as learners

Questions To Consider

What knowledge and skills do we need to function as a professional learning community?

How big a transition will be involved? Are there norms and structures already in place, or will a major shift in school culture be required?

Are there current policies and practices that may interfere with our efforts? How can we deal with possible barriers?

Are there individuals who will be resistant to changes? How can their concerns be addressed?

How can we use time and other resources more effectively as we pursue our goals?

How will improvements and innovations be sustained?

Are there incentives for professional learning and growth?

Are there opportunities for collaborative learning?

Are teachers encouraged to try new ideas and learn from their mistakes?

What avenues are in place for teachers to share what they learn?

How frequently do teachers talk about their work and exchange information and ideas?

(Dufour, 1999; Watkins & Marsick, 1993)

Developing a Common Focus

Without a common focus, the efforts of a professional learning community are not likely to succeed (Senge, 1990). Individual teachers may pursue their own interests, perhaps even undermining each other's efforts. The staff may be tempted to take on too many problems at the same time, fragmenting their energies and attention.

The collective focus or shared vision can be a catalyst for change when it inspires teachers' commitment. Such an approach is more likely to encourage continuous improvement than policies imposed on teachers. The articulated focus can also provide energy and encouragement when the staff encounter difficulties and can help ensure that efforts proceed on track.

There are two possible ways to think about the common focus of the learning community. One is the idea of shared vision developed by the teachers. Often the first step is for teachers to develop their own personal visions of what their school should be like, what they should teach, and what learning they want students to achieve. The staff then shares their visions, perhaps seeking contributions from students and parents as well, and works to connect their individual ideas and to reach consensus about their collective vision for the school.

An alternative approach is to begin by posing common questions or problems. Teachers share topics that they are wondering about or problems that they encounter. Again, the idea is to negotiate areas for inquiry and learning.

The following questions may be helpful in developing a common focus for the learning community (Dufour, 1999):

- What is our vision of the school we are trying to create?
- What goals should we establish in order to achieve our vision?
- What strategies will we use to accomplish our goals?
- What criteria will we use to evaluate our success?
- Is professional development tied to concerns about student learning? Is it congruent with our vision and goals?

Whatever process is used to develop the common focus for the learning community, the next step is for teachers to decide on areas for action. They will develop strategies to address goals or questions, deciding how they will go about learning what they need to know. The teachers take on responsibility for improving teaching and learning and creating the environment that will support their collaboration and professional growth.

Creating a Supportive and Inspiring School

Many of the elements that characterize an effective classroom environment also support teachers as a community of learners. Research on classroom environment has identified the following key areas of mathematics and science learning communities:

- Supportive relationships
- Active participation in creating norms, making decisions, and setting goals
- Clear expectations and responsibilities
- Opportunities for collaboration
- Adequate time
- Interesting and meaningful activities

Ensuring Effective Collaboration

Relationships are the heart of a professional community—learning requires emotional safety, caring, and respect. Participation hinges on teachers' abilities to question each other, to explain their ideas, to take intellectual risks, and to give and receive help.

Effective collaborative learning will not automatically result from convening a group of teachers and giving them time to work together. Most teachers are accustomed to working autonomously in their classrooms. The work of the learning community will require teachers to learn the skills of collaborative learning.

Mutual trust and respect

When teachers share their thinking and their instructional practices, they are subjected to the judgment of their peers. This creates the potential that teachers' differences will be placed in the spotlight and that they will feel threatened. Teachers are often reluctant to make changes in their teaching because they are afraid of making mistakes. The learning community must expect differences and appreciate the learning that is a result of divergent ideas and mistakes (Collay, et al., 1998).

More teachers will be encouraged to share their ideas and take risks when they know that their contributions will be treated with respect. Teachers must believe that their colleagues are making an effort to grasp their approaches and ideas, rather than looking for their mistakes. All interactions must be free of ridicule, quick dismissal, or humiliation.

Establishing ground rules

It will be beneficial for the learning community members to establish guidelines and norms for their work together from the very beginning. They can establish informal rules for ensuring equal opportunities to participate, methods for sharing their learning, dealing with conflicts, and providing support (Senge, 1990).

One way to begin is by exploring the questions: What intellectual and emotional qualities are necessary for professional learning and collective inquiry? What skills are necessary for collaboration?

The group might also begin by brainstorming the characteristics of effective teams, moving on to discuss how they can develop or maintain those characteristics. A sample list is provided below. Going back to the list from time to time will help ensure that the agreed-upon norms are still present.

Characteristics of Effective Teams

- Communication is open and honest, there is a climate of trust
- Mistakes are viewed as opportunities for learning
- Members share energy and enthusiasm
- Information is shared both inside and outside the team
- All members are held accountable for their actions
- A common purpose or direction is shared by all
- Members are encouraged to challenge and support each other
- Creativity and flexibility are encouraged
- Methods for resolving conflict are established and agreed upon

(Preskill & Torres, 1999)

Engaging in Discourse

Discourse plays an important role in a professional community as a means of generating and sharing knowledge. Senge (1990) distinguishes between two types of discourse in learning organizations. Discussion is the more familiar type, and it is focused on making decisions. The process involves accumulating different points of view in order to choose the best one or to get the right answer. Participants usually attempt to persuade others to share their own opinions or perspectives.

The purpose of dialogue is to bring together a diverse pool of viewpoints, looking for areas of both commonality and incoherence. Dialogue often focuses on complex issues, with participants trying to achieve clarity and deeper insights (Senge, 1990). All must be willing to listen and attempt to understand. Rather than finding answers, dialogue involves wondering and asking questions.

The skills of the facilitator are important in maintaining the conditions of dialogue, because it easily shifts into discussion. If this shift occurs, the facilitator can help to get the group back on track by asking participants if the conditions of dialogue are being met. It is important to note that the facilitator's role is focused on the process—she does not act as an expert on the subject matter. The facilitator will generally become less important as the group learns dialogue skills and becomes accustomed to the process. The members of the group may also take turns acting as dialogue facilitators.

In the dialogue process, the group members will take turns expressing their points of view. As each person does this, the other participants will concentrate on suspending their judgments and listening intently. At this stage, rather than looking for agreement, the group is looking for a range of possibilities. After all have had an opportunity to talk, the group will look at the pool of different responses, concentrating on what has been said rather than who said what.

For example, a group of elementary teachers are working with the principal to develop a common approach to using calculators. The teachers have read several articles on the subject, and have also considered the position statement on calculators from the National Council of Teachers of Mathematics.

The facilitator is a teacher who brought the topic of calculators to the group's attention. He asks that the group members begin by sharing their thoughts and ideas, and urges all members to back up their assertions with explanations and evidence.

After each person speaks, the facilitator will ask for other participants who agree to share their own thoughts and examples. The next step is to talk about contrary opinions and examples. Throughout the dialogue, the facilitator asks for any needed clarification and checks for understanding of what is being said. As the next step, the teachers agree to choose and create some activities with calculators that are appropriate for their students. They will share what they have learned and developed at their next meeting.

Monitoring Progress

- Do you believe that the team's efforts will result in action?
- Do you feel that you have learned more about yourself and your colleagues?
- Does the team process allow all voices to be heard and valued?
- What are the problem areas in the team process? What strategies can we use to solve them?

(Preskill & Torres, 1999)

Dealing with Conflict

Community does not mean that everyone must always agree. Above all, the professional learning community should not be used to manipulate teachers toward conformity. Rather, the school must be a place where teachers can be open and honest and where their ways of thinking and teaching are valued.

While many teachers tend to deny or avoid conflict whenever possible, it is inevitable and it can be a positive force when dealt with openly and honestly (Lieberman & Miller, 1999). Diverse opinions serve to strengthen inquiry by providing crucial information and contributing to collective wisdom.

Leaders help teachers to deal with conflict by establishing a sense of safety and by modeling respect for diverse points of view. When conflicts do arise, it may be helpful for everyone involved to reflect on the source. For example, does the disagreement arise from different philosophies, beliefs, or experiences; personality conflicts; or past events? It is helpful if the group has guidelines in place for dealing with disagreements (Preskill & Torres, 1999).

Patience and willingness to accommodate uncertainty are important, as well as providing the time necessary to work out mutually agreed-upon solutions. All members of the group must attempt to listen openly to their colleagues and to withhold judgment. When conflicts prove difficult to resolve, teachers may need to develop questions that will help them come to an agreement and to test the areas of dissent.

A group will deal with conflict more effectively if all members agree to (Preskill & Torres, 1999):

- Listen and focus on the problem, rather than the people involved
- Allow each other to express some anger and frustration
- Accept responsibility for their actions
- Give the process adequate time
- Try to see the issue from another person's perspective
- Trust the perceptions of their colleagues

Sharing Professional Knowledge

One of the primary characteristics of a professional learning community is that learning is shared among all of its members (Watkins & Marsick, 1993). This is true even for teachers' individual learning experiences. Whenever possible, the knowledge of community must be accessible to all, with useful and timely avenues for sharing.

One strategy will be for teachers to create portfolios to document what they have learned. Teachers might work together to write an article for a professional journal. They might develop a presentation to inform parents of changes that are happening in the classroom. Some teachers might even develop learning experiences for their colleagues based on what they have learned.

Sharing information and learning is also important on an ongoing basis, not just at the end of a learning experience. E-mail can be an important internal communication tool. Because teachers have different schedules, e-mail may be the most timely and efficient way for teachers to collaborate, even when their classrooms are next door. Electronic communication is not intended to replace face-to-face interaction, but supplements and supports it.

Sharing results and learning in a professional community serves an additional purpose beyond communicating knowledge and information. It is also a means of celebrating learning and honoring teachers as scholars (Lieberman & Miller, 1999). Celebrating teachers' learning helps to provide the energy and inspiration for continuous inquiry.

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Lesson Study

A professional learning community model from Japan

> Most schools and teachers cannot produce the kinds of learning demanded by the new reforms—not because they do not want to, but because they do not know how, and the systems in which they work do not support them in doing so.
>
> — National Commission on Teaching and America's Future

The statement above points to a widespread problem in education, one that is becoming more prominent as educators examine the progress of the reform of mathematics and science. In their book *The Teaching Gap* (1999), Stigler and Hiebert suggest that changes in teachers' practice will not come about merely as a product of different policies or tests.

Teaching is cultural activity embedded in teachers' experiences from the time they are young children. The problem lies not with the teachers' capabilities or their lack of awareness of policies, but with their lack of opportunities to develop and share professional knowledge of what standards-based teaching is.

Even teachers who acknowledge that their current practices are not as effective as they could be often lack superior alternatives with which to replace them. Developing new approaches requires intensive and deep thought, inquiry, and collaboration.

Stigler and Hiebert suggest the lesson study process that Japanese mathematics teachers use as an effective model for building professional knowledge. They note that the process serves as a means of developing new ideas of teaching, as well as a common language for discussing teaching practices.

In Japan, teachers invest significant amounts of time in collaborating to develop a single lesson. While the main goal is the lesson itself, the teachers also attempt to understand the broader issues of how and why the lesson works. The process flows through the following steps:

1. Defining the Problem

The subject for the lesson study often comes from a problematic concept that the teachers have observed in their own classrooms. However, administrators or policymakers may also suggest a topic.

2. Planning the Lesson

The teachers read books and articles about the problem they are working on. They develop the lesson together, sometimes submitting their plan to other colleagues for feedback.

3. Teaching the Lesson

One teacher is selected to present the lesson in his classroom. The other teachers observe and take notes on what the students are doing and saying during the lesson, and it may also be videotaped for future viewing.

4. Reflecting and Evaluating

The group meets after school to discuss the lesson and their observations. The teacher who presented the lesson speaks first, outlining how he thinks the lesson went and identifying problems he observed. The other teachers contribute their own observations and opinions. The focus of discussion is the lesson itself, not the teaching methods used. The group approaches the lesson as their collective product, so they are critiquing their own work.

5. Revising the Lesson

Based on the problems identified in the first presentation, the study group makes changes in the lesson. Changes are usually based on student misunderstandings that the teachers noticed during their observation.

6. Teaching the Revised Lesson

The lesson is presented again to a different group of students. The same person may teach the lesson a second time or a different teacher may try it out. All the teachers in the school are invited to observe the revised lesson.

7. Reflecting and Evaluating

The whole faculty will participate in the second debriefing session, which follows the same format and

covers the same issues as the first one, as well as more general issues of learning and instruction.

8. Sharing results

Teacher share the lessons they develop through this process, giving them a bank of meticulously crafted lessons to draw upon. The teachers will often publish a report about their study. In addition, teachers from outside the school may be invited to observe the teachers present the lesson.

It may not be practical for schools in the United States to adopt the lesson study process outright. Yet, it can be a useful model for delivering intensive, school-based professional development that districts may want to adapt to their own needs.

Creating Time for Collaboration

One of the greatest challenges of creating a professional learning community is finding time for teachers to work together. However, it is important to note that just providing time is only the first step of the process. Without common goals, skills for collaboration, and activities that are well thought-out, the added time is not likely to make a difference.

- Bringing in substitute teachers, administrators, or retired teachers to cover classes
- Making use of time students spend with specialist teachers or coordinating elective blocks
- Planning community-based learning experiences for students
- Early release for students one day a week
- Team teaching, combining different grade levels or different subject areas to allow teachers to meet.
- Scheduling shared planning or preparation times
- Creating time for extended "working lunches"
- Using e-mail for administrative tasks in order to dedicate staff meetings to professional learning
- Providing time for teachers during student assemblies or meetings

(Loucks-Horsley et al., 1998)

References

Adajian, L.B. (1996). Professional communities: Teachers supporting teachers. *Mathematics Teacher, 89*(4), 321–325.

Collay, M., Dunlap, D., Enloe, W., & Gagnon, Jr., G.W. (1998). *Learning circles: Creating conditions for professional development.* Thousand Oaks, CA: Corwin Press.

Dewey, J. (1916). *Democracy and education.* New York, NY: Macmillan.

Dufour, R.P. (1999). Help wanted: Principals who can lead professional learning communities. *NASSP Bulletin, 83*(6), 12–17.

Hord, S.M. (1997). *Professional learning communities: Communities of continuous inquiry and improvement.* Austin, TX: Southwest Educational Development Laboratory.

Lieberman, A., & Miller, L. (1999). *Teachers—Transforming their world and their work.* New York, NY: Teachers College Press.

Loucks-Horsley, S., Hewson, P.S., Love, N., & Stiles, K.E. (1998). *Designing professional development for teachers of science and mathematics.* Thousand Oaks, CA: Corwin Press.

National Commission on Teaching and America's Future (1996). *What Matters Most: Teaching For America's Future.* Woodbridge, VA: Author.

Nelson, B.S. (1999). *Building new knowledge by thinking: How administrators can learn what they need to know about mathematics education reform.* Newton, MA: Education Development Center

Newmann, F.M., & Wehlage, G.G. (1995). *Successful school restructuring.* Madison, WI: University of Wisconsin, Center on Organization and Restructuring of Schools.

Preskill, H., & Torres, R.T. (1999). *Evaluative inquiry for learning in organizations.* Thousand Oaks, CA: Sage.

Senge, P.M. (1990). *The fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Stigler, J.W., & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom.* New York, NY: The Free Press.

Watkins, K.E., & Marsick, V.J. (1993). *Sculpting the learning organization: Lessons in the art and science of systemic change.* San Francisco, CA: Jossey-Bass.

Zederayko, G.E., & Ward, K. (1999). Schools as learning organizations: How can the work of teachers be both teaching *and* learning? *NASSP Bulletin, 83*(6), 34–45.

Resources

The following resources are available through the Mathematics and Science Education Center's lending library. To request materials, contact the Center at (503) 275-9499 or by e-mail (math_and_science @nwrel.org).
The collection is available for searching online at: www.nwrel.org/msec/resource/index.html

Building New Knowledge by Thinking: How Administrators Can Learn What They Need to Know About Mathematics Education Reform. (1999). B.S. Nelson.

Changing the Classroom from Within: Partnership, Collegiality, Constructivism. (1995). J.I. Stepans, B.W. Saigo, & C. Ebert.

The Constructivist Leader. (1995). L. Lambert, et al.

Creating the Conditions for Classroom Improvement. (1999). D. Hopkins, et al.

The Fifth Discipline Fieldbook. (1994). P. Senge, et al.

Learning Circles: Creating Conditions for Professional Development. (1998). M. Collay, et al.

Teachers—Transforming Their World and Their Work. (1999). A. Lieberman & L. Miller.

The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom. (1999). J.W. Stigler & J. Hiebert.

Useful Web Sites

ERIC Clearinghouse on Educational Management
http://eric.uoregon.edu/

Professional Learning Communities
http://www.sedl.org/pubs/catalog/items/cha34.html

WestEd's Professional and Organizational Learning Program
http://www.WestEd.org/pol/

NW Consortium for Mathematics and Science Teaching

The Mathematics and Science Education Center announces the Northwest Consortium for Mathematics and Science Teaching (Northwest CMAST). Working in the five-state region of Alaska, Idaho, Montana, Oregon, and Washington, the Consortium will conduct activities designed to help schools ensure that all students have opportunities to learn rigorous mathematics and science.

Working with state departments of education and other key partners, Northwest CMAST will provide educators with:

- Access to best practices, particularly for diverse learners
- Assistance to help those in rural areas overcome isolation and lack of resources
- Services to schools to support all students' efforts to meet state performance standards

The main activities of Northwest CMAST will include partner sites, strategic alliances with existing projects and organizations, and annual state institutes.

In each state, Northwest CMAST will work with two partner sites, providing intensive technical assistance. The sites will be located in a school or district, with services extending to three to five nearby sites. The goal will be to build local capacity and regional networks to sustain these efforts over time.

Northwest CMAST will maximize its impact by sharing effective resources, strategies, and materials with state initiatives, projects, and organizations. This strand of work will also provide learning experiences for teacher leaders and professional development providers.

In addition, Northwest CMAST will produce *Northwest Teacher,* a mathematics and science journal published three times a year and an extensive, interactive Web site.

The Eisenhower Regional Consortia are a field-based national network of 10 organizations helping educators improve K–12 math and science education. The consortia work in partnership with the Eisenhower National Clearinghouse.

Mathematics and Science Education Center

The Mathematics and Science Education Center provides resources to support challenging, effective mathematics and science curriculum, instruction, and assessment for all students. As part of the Center's mission, we offer a series of publications, models for mathematics problem-solving and science inquiry, and a lending library of support materials.

Publications

The *It's Just Good Teaching* series includes publications and videos that illustrate and promote effective teaching and learning strategies. The materials in the series are grounded in research and guided by examples from Northwest teachers.

While supplies last, single copies are available free of charge in Alaska, Idaho, Montana, Oregon, and Washington. The publications are also available online in PDF format: www.nwrel. org/msec/pub.html

Available Titles

The *It's Just Good Teaching* series includes:

Science and Mathematics for All Students

Inquiry Strategies for Science and Mathematics Learning

Science and Mathematics Standards in the Classroom

Assessment Strategies to Inform Science and Mathematics Instruction

Engaging Families in Mathematics and Science Education

Integrating Technology into Middle School Mathematics

The Inclusive Classroom: Mathematics and Science Instruction for Students with Learning Disabilities

The Inclusive Classroom: Teaching Mathematics and Science to English-Language Learners

Why Won't You Tell Me the Answer? Inquiry in the High School Classroom [videotape]

How Do You Spell Parallel? Visiting Middle School Mathematics [videotape]

Resource Collection

The resource collection is a lending library of 1,500+ teacher support materials, professional development literature, innovative curriculum, and videos. The collection is available for searching online at: www.nwrel.org/msec/resource/

Contact the Center at (503) 275-9499 or by e-mail (see below) for more information. Materials may be checked out for 21 days free of charge in the Center's region of Alaska, Idaho, Montana, Oregon, and Washington.

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Our Mission

The Mathematics and Science Education Center supports teachers' efforts to:

- *Facilitate engaging and authentic learning experiences*
- *Guide students in actively exploring and making sense of the world*
- *Challenge all students to become rigorous thinkers and creative problem solvers*

Practical Inquiry
A topical series of the Mathematics and Science Education Center at the Northwest Regional Educational Laboratory

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